

Claims

1. A radiation detector for detecting radiation (8) according to a predefined spectral sensitivity distribution (9) that exhibits a maximum at a predefined wavelength  $\lambda_0$ , comprising a semiconductor body (1) with an active region (5) serving to generate a detector signal and intended to receive radiation,

characterized in that

said active region (5) comprises a plurality of functional layers (4a, 4b, 4c, 4d), said functional layers having different band gaps and/or thicknesses and being implemented such that said functional layers at least partially absorb radiation in a wavelength range that includes wavelengths greater than the wavelength  $\lambda_0$ .

2. The radiation detector as in claim 1,

characterized in that

said predefined spectral sensitivity distribution (9) is that of the human eye.

3. The radiation detector as in claim 1 or 2,

characterized in that

said semiconductor body (1) contains at least one III/V semiconductor material.

4. The radiation detector as in one of the preceding claims,

characterized in that

disposed after said active region is a filter layer structure (70) comprising at least one filter layer (7, 7a, 7b, 7c), which filter layer structure (70) determines the short-wave side (101) of the detector sensitivity (10) in accordance with the predefined spectral sensitivity distribution (9) by absorbing radiation in a wavelength range that includes wavelengths smaller than  $\lambda_0$ .

5. A radiation detector for detecting radiation in accordance with the predefined spectral sensitivity distribution (9) of the human eye, which exhibits a maximum at the wavelength  $\lambda_0$ , comprising a semiconductor body (1) with an active region (5) serving to generate a detector signal and intended to receive radiation,

characterized in that

said semiconductor body (1) contains at least one III/V semiconductor material and said active region (5) comprises a plurality of functional layers.

6. The radiation detector as in claim 5,

characterized in that

said functional layers (4a, 4b, 4c, 4d) at least partially absorb radiation (8) in a wavelength range that includes wavelengths greater than the wavelength  $\lambda_0$ .

7. The radiation detector as in claim 5 or 6,

characterized in that

said functional layers (4a, 4b, 4c, 4d) have different band gaps and/or thicknesses.

8. The radiation detector as in one of claims 5 to 7,

characterized in that

disposed after said active region is a filter layer structure (70) comprising at least one filter layer (7, 7a, 7b, 7c), which filter layer structure (70) determines the short-wave side (101) of the detector sensitivity (10) in accordance with said predefined spectral sensitivity distribution (9) by absorbing radiation in a wavelength range that includes wavelengths smaller than  $\lambda_0$ .

9. A radiation detector for detecting radiation (8) in accordance with a predefined spectral sensitivity distribution (9) that exhibits a maximum at a predefined wavelength  $\lambda_0$ , comprising a semiconductor body (1) with an active region (5) serving to generate detector signals and intended to receive radiation,

characterized in that

disposed after said active region is a filter layer structure (70) comprising at least one filter layer (7, 7a, 7b, 7c), which filter layer structure (70) determines the short-wave side (101) of said detector sensitivity (10) in accordance with said predefined spectral sensitivity distribution (9) by absorbing radiation in a wavelength range that includes wavelengths smaller than  $\lambda_0$ .

10. The radiation detector as in claim 9,  
characterized in that  
said predefined spectral sensitivity distribution (9) is that of the human eye.
11. The radiation detector as in claim 9 or 10,  
characterized in that  
said semiconductor body (1) contains at least one III/V semiconductor material.
12. The radiation detector as in one of claims 9 to 11,  
characterized in that  
said active region (5) comprises a plurality of functional layers.
13. The radiation detector as in claim 12,  
characterized in that  
said functional layers (4a, 4b, 4c, 4d) at least partially absorb radiation (8) in a wavelength range  
that includes wavelengths greater than the wavelength  $\lambda_0$ .
14. The radiation detector as in claim 12 or 13,  
characterized in that  
said functional layers (4a, 4b, 4c, 4d) have different band gaps and/or thicknesses.
15. The radiation detector as in one of the preceding claims,  
characterized in that  
said filter layer structure (70) is disposed after said active region (5) in the direction of the  
incident radiation (8).
16. The radiation detector as in one of the preceding claims,  
characterized in that  
said filter layer structure (70) comprises a single filter layer (7) having a direct band gap and an  
indirect band gap.

17. The radiation detector as in claim 16,  
characterized in that  
said direct band gap is larger than the band gap of a functional layer disposed after said filter  
layer (7) on the side nearer said active region (5).

18. The radiation detector as in either of claims 16 or 17,  
characterized in that  
said filter layer (7) determines the short-wave side of said detector sensitivity by absorbing  
radiation via said indirect band gap in a wavelength range that includes wavelengths smaller than  
 $\lambda_0$ .

19. The radiation detector as in one of claims 16 to 18,  
characterized in that  
said direct band gap determines a short-wave limit of said detector sensitivity.

20. The radiation detector as in one of claims 16 to 19,  
characterized in that  
the thickness of said filter layer (7) is greater than 1  $\mu\text{m}$ , particularly 10  $\mu\text{m}$  or more.

21. The radiation detector as in at least one of the preceding claims,  
characterized in that  
said filter layer structure (70) comprises a plurality of filter layers (7a, 7b, 7c) of different band  
gaps and/or thickness.

22. The radiation detector as in claim 21,  
characterized in that  
said filter layer structure (70) determines the short-wave side of said detector sensitivity (10) by  
absorbing radiation via a direct band gap of the respective filter layer (7a, 7b, 7c) in a  
wavelength range that includes wavelengths smaller than  $\lambda_0$ .

23. The radiation detector as in claim 21 or 22,  
characterized in that  
said filter layer structure (70) has a thickness of 1  $\mu\text{m}$  or less.
24. The radiation detector as in at least one of the preceding claims,  
characterized in that  
said functional layers (4a, 4b, 4c, 4d) determine by their implementation the long-wave side (102) of said detector sensitivity (10) in accordance with said predefined spectral sensitivity distribution (9) for wavelengths greater than  $\lambda_0$ .
25. The radiation detector as in at least one of the preceding claims,  
characterized in that  
the respective band gaps of functional layers (4a, 4b, 4c, 4d) disposed one after the other in said semiconductor body (1) at least partially increase in the direction of the incident radiation (8).
26. The radiation detector as in at least one of the preceding claims,  
characterized in that  
said functional layers (4a, 4b, 4c, 4d) or at least a portion of said functional layers are substantially undoped.
27. The radiation detector as in at least one of the preceding claims,  
characterized in that  
said active region (5) comprises at least one heterostructure.
28. The radiation detector as in at least one of the preceding claims,  
characterized in that  
said active region (5), particularly the functional layers, or said filter layer structure (70) contains at least one III/V semiconductor material, preferably  $\text{In}_x\text{Ga}_y\text{Al}_{1-x-y}\text{P}$ ,  $\text{In}_x\text{Ga}_y\text{Al}_{1-x-y}\text{As}$  or  $\text{In}_x\text{Ga}_y\text{Al}_{1-x-y}\text{N}$ , where in each case  $0 \leq x \leq 1$ ,  $0 \leq y \leq 1$  and  $x + y \leq 1$ .

29. The radiation detector as in at least one of the preceding claims,  
characterized in that  
said semiconductor body (1) particularly the semiconductor body comprising said filter layer  
structure (70), is monolithically integrated.